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ABSTRACT

The purpose of the Knowledge Transformation Program at The National Center for Research in Vocational Education has been to provide intellectual leadership to the field and to facilitate use of significant research results by those who need them most. An important focal point of the program's work is the Information Analysis Product Planning Matrix, which was applied, for example, to a recent series of information products. Recent scholarship in the areas of knowledge transformation and knowledge utilization has influenced further research by National Center Staff. At the National Center studies have been completed and recommendations made for developments in knowledge transformation. A Knowledge Processes Model represents the most recent effort to conceptualize the processes by which information is transformed for use by specific audiences. Practical program methods based on theory and research include (1) topic selection and development, which meets information needs in a variety of ways for different audiences over a period of time; (2) product specifications, dealing with type, length, content, and style as they relate to program goals and information needs of the intended audience; (3) author and reviewer selection, dependent on product desired; (4) monitoring writing; (5) peer review and revision; and (6) packaging for distribution. (YLB)

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RESEARCH UTILIZATION THROUGH KNOWLEDGE TRANSFORMATION

A Programmatic Application of Theory[1]

by

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Introduction

As with education in general, the results of research in vocational education have not been widely used. Rich (in Radnor et al., 1977) points out that "R&D outcomes seldom reach the local school teacher, administrator, and decision maker in a form which they can use or act upon" (p. 1). Syntheses of research, research reports, and even interpretations of research results are often targeted to other researchers. Few documents based on research are conceptualized from the beginning with the practitioner in mind. Many fail to reach the practitioner in any form. Yet, the importance of reaching diverse audiences with information based on research and development efforts cannot be sufficiently underscored. A landmark "Statement of Agreement by Professionals in the Field of Educational Dissemination" emphasized the need for "a broad, intergrated resource base of knowledge" and "continuous efforts to organize and transform the knowledge base into language, format and styles suitable to a variety of different audiences" (1977, pp. 3-4).

The Committee on Vocational Education Research and Development, convened by the National Academy of Sciences, likewise concluded that "many vocational educators are either unaware of R&D results and products or are unable to understand (and subsequently use) them . . . . various kinds of information

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[1]Paper presented at the American Educational Research Association annual meeting, April 14, 1981, Los Angeles.

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analysis are often desirable" (1976, p. 80). Its recommendation to remedy the situation was as follows:

> The Commissioner of Education should establish an information analysis program to transform information on critical problems into appealing, new forms targeted to diverse user groups . . . . New products and dissemination strategies based on the results of user studies should be developed and implemented (p. 81).

This recommendation gave new life to a knowledge transformation program that has been underway at the National Center for Research in Vocational Education for 15 years. Work under the knowledge transformation program has resulted in more than 250 knowledge products which serve the needs of several target audiences striving to improve the quality of programs and practices in vocational education.

This paper examines the theoretical constructs that undergird the program, describes the expansion of the original conceptual framework, and poses some important research questions which should be addressed if knowledge transformation is to become a widely accepted means of improving research utilization.

Objectives of the Program

The purpose of the knowledge transformation program is to provide intellectual leadership to the field and to facilitate the use of significant research results by those who most need them. The objectives of the program are:

1. To "transform information on critical problems into appealing, new forms targeted to diverse user groups" (COVERD, 1976, p. 81);

2. To communicate R&D-based information to practitioner groups which need the information, including teachers, administrators, and decision makers;

3. To involve both researchers and practitioners in the development process in order to create information directly responsive to the needs of those diverse groups; and

4. To provide, through development of theory and practice, conceptual leadership to the field in the area of knowledge transformation and utilization.

The institutional commitment to these objectives has been sustained with the assistance of the National Institute of Education (NIE) and the Office of Vocational and Adult Education (OVAE). The NIE-sponsored ERIC Clearinghouse on Adult, Career and Vocational Education has been engaged in information analysis since 1966. Further knowledge transformation activities have been undertaken since 1978 as part of a broad based dissemination and utilization program under the National Center's contract with OVAE. Some additional short-term knowledge transformation projects have been completed under federal sponsorship. The range of products developed under the various projects and programs has included review and syntheses of research; analyses of research and curriculum; handbooks; interpretations; annotations, abstracts, and bibliographies; and filmstrips and audiocassettes.

Perspective

Attention to the complexities of communicating R&D-based information in education has given rise to a body of literature on the processes by which information is transformed for use. Areas of inquiry include knowledge creation, transformation, transfer and dissemination, and utilization. Two terms commonly applied to the area of principal concern here are knowledge transformation and knowledge synthesis.

The term knowledge transformation, as generally understood by researchers in the field, involves "placing the available knowledge into some kind of framework or overall perspective; e.g., summarizing only that which is relevant to particular problems of interest to a particular administrator . . . ." (Rich, 1977, p. 3). Magisos (1977) clarified the term "knowledge transformation" as it has been understood and practiced at the National Center: "The

knowledge transformation program at the ERIC Clearinghouse . . . is based upon practitioner needs. Its products are targeted to groups of practitioners. The rationale for the kinds of products is roughly parallel to Bloom's Taxonomy of Educational Objectives" (p. 2).

Knowledge transformation is not to be confused with synthesis, which Rich defines as "the act of reducing large portions of knowledge into a manageable product" (1977, p. 3). A more comprehensive definition indicates that synthesis is the assemblage of separate parts into a new whole, creating new insights or a new approach from the recombination of the separate parts. Synthesis is only one process within the overall process of knowledge transformation.

Planning Matrix

The Information Analysis Product Planning Matrix (Magisos, 1970) developed for the ERIC Clearinghouse on Vocational and Technical Education was an early conceptualization to fit specific information product types into the six levels of cognitive processes identified by Bloom (1956). Thus, the National Center's concern for targeting of information materials to diversified audiences predated the COVERD report and more recent transformation efforts funded by various federal agencies.

The matrix links the increasingly complex cognitive processes as outlined by Bloom with increasingly sophisticated knowledge product types intended for audiences at increasing levels of intellectual involvement. This is not to say, of course, that less sophisticated product types are not useful to scholars or that more sophisticated product types are not useful to practitioners. The intent of the matrix is to provide a point of reference for product differentiation.

Figure 1. Information analysis product planning matrix.

Level of Treatment	Information Analysis Product	Primary Target Audiences
Knowledge	Annotations Abstracts Bibliographies	Practitioners
Comprehension	Information releases Interpretations Translations Extrapolations	Practitioners
Application	Guidelines "Practice in..." Manuals	Practitioners
Analysis	"An analysis of research on..."	Scholars
Synthesis	"Review and synthesis of research on..."	Scholars
Evaluation	Evaluation of research	Scholars

Source: Magisos, J. H. Information Analysis Plan for the ERIC Clearinghouse on Vocational and Technical Education. Columbus, OH: National Center for Research in Vocational Education, The Ohio State University, 1970.

An Example

Although knowledge transformation activities at the National Center have progressed considerably since 1970, this early conceptualization has served as an important focal point for our work. An appropriate illustration of the application of this matrix is a recent series of information products developed under the National Center contract with the Office of Vocational and Adult Education. The series included a review and synthesis paper, Development of Individualized Education Programs (IEPs) for the Handicapped in Vocational Education (McKinney and Seay, 1979); a "brief" or executive summary with the same title as the paper; a handbook (Phelps and Batchelor, 1979); and

a filmstrip (National Center, 1981). The review and synthesis of research corresponds to the cognitive process of synthesis and is intended for scholars. The "brief" communicates knowledge to administrators. The handbook and filmstrip are both applications designed for use with or by vocational classroom teachers. All were developed from the same knowledge base. Type, length, content, and style have been manipulated to address the information needs of specific audience groups.

Related Literature

Recent scholarship in the areas of knowledge transformation and knowledge utilization, much of which has been pursued under the auspices of the National Institute of Education and the National Science Foundation, has influenced further research by National Center staff. In particular, the work of Rich and Goldhar (in Radnor, Hofler, and Rich, 1977), Glaser (1978), Reed (director of the NIE-sponsored R&D Interpretation Service), and Glass (1976; McGaw and Glass 1980) has been influential. Related work in the area of knowledge utilization by Larsen (1980), Miles (1980), Louis (1979), Sieber (1974; 1979), and others has been considered insofar as such scholarship has an impact on knowledge transformation theory and practice. Research Within Reach: A Research-Guided Response to Concerns of Reading Educators (Weaver and Shonkoff, 1978) and conferences and workshops on knowledge transformation by the Northwest Regional Educational Laboratory are further evidence of the attention scholars are directing to knowledge transformation activities. At the National Center, Bhaerman (1979) and Kowle (1979) have completed studies and made recommendations for developments in knowledge transformation. A Knowledge Processes Model developed by Magisos (Kowle, 1980), and revised by Magisos and Kowle for this presentation represents the most recent effort to

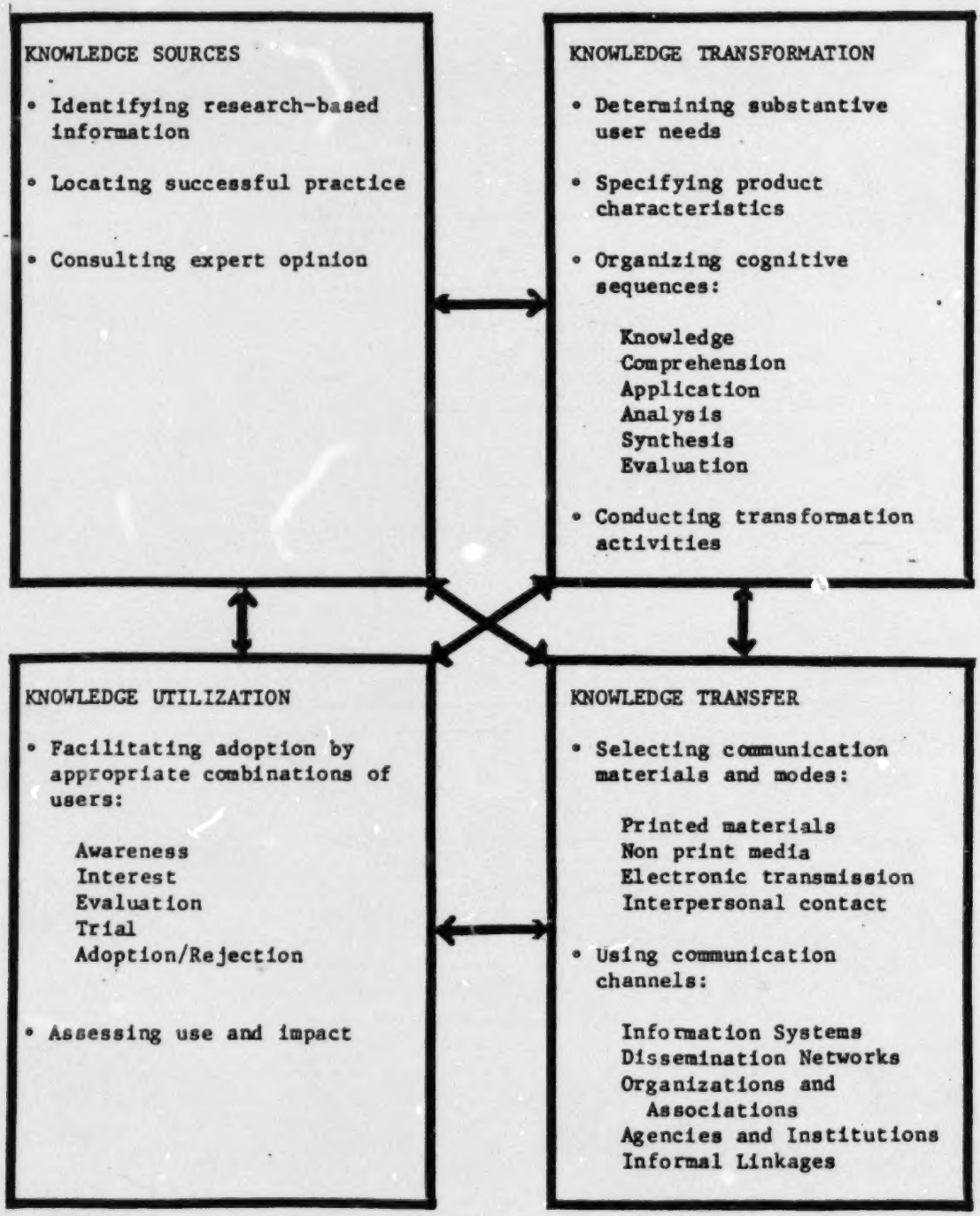
conceptualize the processes by which information is transformed for use by specific audiences.

Knowledge Processes Model

Like the earlier Information Analysis Product Planning Matrix, the Knowledge Processes Model evolved out of the application of Bloom's taxonomy to the concept of differentiated product types. Within the transformation process, it is assumed that one or more cognitive processes will be engaged in as information is transformed for audience use. In the broader context of the model, transformation is only one process in the communication of knowledge. At the same time, it has been the process most amenable to influence by work at the National Center.

The model is designed to illustrate the relationships between what the present authors consider to be the major processes in the communication of information. The direction of the heavy arrows between blocks depicts the "usual" or expected flow of information from source to transformation to transfer to use. In other words, an item of information from some source (whether a research finding, a successful practice, or an opinion) is transformed or changed in the process of communication, as it is transferred via some means (material and mode) to an audience which then uses the information at some level from simple awareness to adoption or rejection. The flow of information from source to use is not always predictable and direct, however. Thus, additional arrows within the model suggest interaction among all the processes depicted. For example, data on the assessment of knowledge use and impact provide feedback to the process of transformation. Local teachers for whom a handbook (application of research) is intended might provide the authors with important use-related information before the transformation is initiated.

Figure 2. Knowledge processes model.



Additional examples of interaction among knowledge processes are easily identifiable. Although for the most part, we assume that information is transformed before being transferred, it could travel directly from the source through a communication channel to an audience. For instance, calling an expert for an opinion is direct interpersonal transfer, despite the fact that the information might later be transformed as it is communicated from one person to another.

Researchers in the area of knowledge utilization increasingly recognize the importance of studying the ways knowledge is transformed as it is used. As Larsen comments, "In some settings, knowledge may not be used if implemented in its original form, but it may work very well if changed somewhat to meet the circumstances of the user" (1980, p. 428). The transformation, transfer, and use of knowledge all may affect the sources of knowledge, and, ultimately, the choice to produce knowledge in certain areas as opposed to others.

Clearly, the Knowledge Processes Model affords a wealth of opportunity for scholarly investigation. The authors recognize, at the same time, that this is yet another addition to an area of inquiry already overpopulated with models and theories (Sieber, 1974; Larsen, 1980). Furthermore, a decision has been made to rely on certain trusted and familiar theories, such as Bloom's taxonomy (for the transformation process) and Rogers' (1962; Rogers and Shoemaker, 1971) adoption model (for the utilization process). These theories have been found to be workable within our experience, though other scholars may take exception to the choices. Lastly, the transformation process is the primary segment of the model in which we have concentrated our efforts during the course of our 15-year experience. We have only infrequently had the opportunity to initiate work within some of the other processes.

Program Methods

The methods in a knowledge transformation program, while based upon theory and research, must also be practical. Topics must be selected and developed; products specified; authors and reviewers selected and commissioned; writing monitored; manuscripts reviewed and revised; and final products packaged for distribution.

Topic Selection and Development

Vocational educators have a variety of information needs which can be met with knowledge transformation products. National Center staff endeavor to develop topical areas to meet these information needs before specific topics are selected for treatment. This activity includes obtaining broad input from the National Center's Advisory Council, staff, target audience representatives, and substantive experts.

Long range plans are developed for various topical areas. For example, a review and synthesis of research in business and office education is developed every three to five years to provide regular bench marks for this occupational field. In problem areas, the topic may be segmented into subtopics, each of which will be treated separately. For example, the general topic of vocational education's involvement in economic development might be segmented to include papers on reindustrialization and worker productivity. Topical areas or specific topics might be treated in a variety of ways for different audiences over a period of time. For example, an initial review and synthesis for researchers might later be developed as an interpretative paper for policy makers or a handbook for teachers. National Center staff have been able to plan across more than one sponsored project to ensure adequate treatment of topical areas. An exploratory literature search usually is conducted to

determine the extant knowledge base, gaps in the knowledge base, and problems encountered by previous researchers.

Product Specification

Knowledge products play an important role in the achievement of vocational education program goals. In many cases, the knowledge product may be the first examination of problems and issues related to a present or potential program goal. This examination may lead to research and development and further knowledge transformation, legislative action, and administrative decisions. All knowledge products must have an audience if they are to be useful; therefore, product specifications must be based upon program goals and target audience information needs.

For example, during the career education movement, the National Center developed a Review and Synthesis of Foundations for Career Education (Herr, 1972). This paper drew together disparate career development theories and served as the basis for model building and program development by a variety of organizations across the nation. It was repeatedly cited as the basis for study designs and program decisions.

Once a program goal in a topical area has been given priority, it is necessary to determine what audiences need information to support their role in achieving the goal. The target audience is the primary consideration in determining the nature of the knowledge product. Specifications for a knowledge product should deal with type (e.g., review and synthesis, interpretation, etc.), length, content, and style as they relate to the program goals and information needs of the intended audience.

Author and Reviewer Selection

An extensive search for authors and reviewers is conducted, the choice of author being largely dependent on the product desired. The literature search assists staff in ascertaining who has been active in the field. Discussions with these substantive experts in turn reveals other active scholars. Reviewers are often selected from among the author candidate pool. Initial discussions with an author must be candid about the product type, length, content, and style desired. Since defaults or delays are common and revisions often require more intensive work than expected, experience suggests the advisability of maintaining a reserve file of acceptable manuscripts.

Monitoring Writing

Support of an author is provided at various stages. Initially, the product specifications and content outline must be jointly agreed upon. Abstracts from a computer search and microfiche copies of documents are provided to the author to supplement personal resources. Periodic progress checks are necessary to ascertain further need for support or potential delays in the production schedule.

Review and Revision

All products undergo a peer review and authors are made aware of this expectation. Anonymity of authors and reviewers is maintained. Authors are given assistance in interpreting the expectations created by the review. After revision by an author, the manuscript is made to conform to editorial standards. The final manuscript is reviewed by the author, because content is a joint responsibility.

Packaging for Distribution

Packaging (i.e., titling, cover, print style, product size, etc.) is now planned simultaneously with product development. Increasingly, initial product specifications include consideration of packaging for distribution. A goal is to have recognizable product types (e.g., review and synthesis, policy analysis, interpretation, etc.) which appeal to specific audiences.

Conclusions

Although specific, widespread changes in educational practice are difficult to attribute to one program improvement strategy such as knowledge transformation, there is evidence that products are reaching intended audiences and that program changes are beginning to take place. Products are reaching audiences through sponsored distribution, cost recovery sales, and training activities of the National Academy for Vocational Education, state and local education agencies, and universities. Issue-oriented papers have been used by legislative and administrative staff members at federal and state levels. Practice-oriented products have been used by teachers, counselors, and administators at the local level.

The Knowledge Processes Model provides a framework for research as well as program direction. While continuing to operate the knowledge transformation program, the National Center is looking for opportunities to explore some fundamental research questions inherent in the model. These are:

1. To what extent are knowledge transformation products being used by intended audiences?
2. What program effects can be attributed to the use of products?
3. How effective has knowledge transformation been in comparison to alternative approaches?
4. Which product types are most effective for specific purposes, content, audiences, and approaches?

5. What research methodologies are most appropriate for inquiry related to use, effectiveness, and impact of knowledge transformation efforts?

6. What product development procedures will best facilitate the cognitive processes involved in knowledge transformation?

7. What cognitive processes are used by target audiences to further transform knowledge for specific use?

Some data can be collected in the course of conducting the program. At the same time, it is important for sponsoring agencies to consider combining scholarly inquiry with ongoing programs. The small additional investment can magnify the effect of the larger initial investment in the operating program.

Educational Significance of the Program

The knowledge transformation program is educationally significant from at least four perspectives. It provides a cost effective means of capitalizing on earlier R&D efforts by facilitating use of results. Knowledge transformation frequently casts previous research findings in a new light which exceeds the original intentions and provides a focus for further R&D effort. It communicates the body of information which should be shared by knowledge producers and users. It provides various educational practitioners with a means of understanding and using knowledge otherwise hidden in the research community behind a veil of specialized language.

Moreover, where program development in knowledge transformation includes model building it creates a framework for research problems, the solution of which contributes to program improvement and further model building. Hence, a theory is ultimately practical, just as practice can provide theoretical insight.

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